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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/070,684

09/12/2002

Tomoko Ohtsuki

112162

9272

7590

10/24/2005

Oliff & Berridge  
PO Box 19928  
Alexandria, VA 22320

EXAMINER

RODRIGUEZ, ARMANDO

ART UNIT

PAPER NUMBER

2828

DATE MAILED: 10/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/070,684

Applicant(s)

OHTSUKI, TOMOKO

Examiner

ARMANDO RODRIGUEZ

Art Unit

2828

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-64 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13, 14 and 53-58 is/are allowed.
- 6) ☐ Claim(s) \_\_\_\_\_ is/are rejected.
- 7) ☒ Claim(s) 19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>7/25/05, 4/1/05</u> | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

The information disclosure statement filed on July 14, 2004 has been considered.

The 35 USC 112 second paragraph rejection has been withdrawn based on applicant's amendment filed on July 25, 2005.

The indicated allowability of claims 1 are withdrawn in view of the newly discovered reference(s) to Ohtsuki et al (US 6,590,698). Rejections based on the newly cited reference(s) follow.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 11, 12, 20-28, 47-52 are rejected under 35 U.S.C. 102(e) as being anticipated by Ohtsuki et al (US 6,590,698).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome

either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Regarding claim 1,

Figure 1 illustrates an ultraviolet laser apparatus having a laser (11), which provides a beam having a wavelength of 1.544  $\mu\text{m}$  [applicant's infrared range] column 10 line 10, illustrates optical fiber amplifiers (18) and (19), and in column 9 lines 40-41 discloses the laser device of figure 1 having nonlinear crystal for wavelength conversion of the amplified light. Column 25 lines 13-25 disclose the wavelength conversion portion used in the laser apparatus of figure 1. Figures 11(a) to 11 (d) illustrates the wavelength conversion portion, which includes a plurality of nonlinear crystals. Column 25 lines 59-61 disclose the use of temperature control of the nonlinear crystal to achieve phase matching for wavelength conversion.

Regarding claim 11,

Figure 1 illustrates an ultraviolet laser apparatus having a laser (11), which provides a beam having a wavelength of 1.544  $\mu\text{m}$  [applicant's infrared range] column 10 line 10, illustrates optical fiber amplifiers (18) and (19), and in column 9 lines 40-41 discloses the laser device of figure 1 having nonlinear crystal for wavelength conversion of the amplified light. Column 25 lines 13-25 disclose the wavelength conversion portion used in the laser apparatus of figure 1. Figures 11(a) to 11 (d) illustrates the wavelength conversion portion, which includes a plurality of nonlinear crystals [applicant's relay optical systems].

Regarding claim 12,

Column 25 lines 44-46 discloses the laser apparatus of figure 1 along with the wavelength portion of figures 11(a)- 11 (b) as generating an 8<sup>th</sup> harmonic. Column 52 lines 10-14 disclose the generating a 7-times high harmonic [applicant's seventh order harmonic] by sum frequency.

Regarding claim 20,

Column 51 lines 35-41, discloses a fundamental wavelength of 1.5  $\mu\text{m}$  and generating ultraviolet by 10-times high harmonic [applicant's tenth order harmonic].

Regarding claim 21,

Column 52 lines 35-41, discloses laser light of 1.1  $\mu\text{m}$  and generating ultraviolet by 7-times high harmonic [applicant's seventh order harmonic].

Regarding claims 22-26 and 50-52,

Column 52 line 63 to column 53 line 2, discloses illuminating a mask with the ultraviolet laser apparatus and projecting a pattern from the mask onto a substrate.

Regarding claims 27, 28, 48 and 49,

Column 53 lines 24-30, discloses a modulator for generating pulses from the laser. Column 53 lines 38-43, discloses an adjustment device for adjusting an emission property of the ultraviolet light.

Regarding claim 47,

Column 25 lines 57-62 of Ohsuki et al, discloses using non-critical phase matching (NCPM).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 3, 29-34 are rejected under 35 U.S.C. 103(a) as being obvious over Ohtsuki et al (US 6,590,698) in view of Petrov et al.

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(I)(1) and § 706.02(I)(2).

Regarding claim 2,

Ohsuki et al illustrates in figure 1 an ultraviolet laser apparatus having a laser (11), which provides a beam having a wavelength of 1.544  $\mu\text{m}$  [applicant's infrared range] column 10 line 10, illustrates optical fiber amplifiers (18) and (19), and in column 9 lines 40-41 discloses the laser device of figure 1 having nonlinear crystal for wavelength conversion of the amplified light. Column 25 lines 13-25 disclose the wavelength conversion portion used in the laser apparatus of figure 1. Figures 11(a) to 11 (d) illustrates the wavelength conversion portion, which includes a plurality of nonlinear crystals. Ohsuki et al is silent as to one of the plurality of nonlinear crystal is a lithium tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ ).

Petrov et al discloses in the abstract the use of lithium tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ ) for ultraviolet generation laser beams.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the lithium tetraborate ( $\text{Li}_2\text{B}_4\text{O}_7$ ) of Petrov et al with the laser apparatus of Ohsuki et al because it will allow for noncritical phase matching with maximized effective nonlinearity (see abstract of Petrov et al).

Regarding claim 3,

Column 25 lines 44-46 of Ohsuki et al discloses the laser apparatus of figure 1 along with the wavelength portion of figures 11(a)- 11 (b) as generating an 8<sup>th</sup> harmonic. Column 52 lines 10-14 disclose the generating a 7-times high harmonic [applicant's seventh order harmonic] by sum frequency.

Regarding claim 29,

Column 25 lines 57-62 of Ohsuki et al, discloses using non-critical phase matching (NCPM).

Regarding claims 30 and 31,

Column 53 lines 24-30 of Ohsuki et al, discloses a modulator for generating pulses from the laser. Column 53 lines 38-43, discloses an adjustment device for adjusting an emission property of the ultraviolet light.

Regarding claims 32-34

Column 52 line 63 to column 53 line 2 of Ohsuki et al, discloses illuminating a mask with the ultraviolet laser apparatus and projecting a pattern from the mask onto a substrate.

Claims 4, 9, 10, 16, 18, 41-46 are rejected under 35 U.S.C. 103(a) as being obvious over Ohtsuki et al (US 6,590,698) in view of Yoshimura et al.

Regarding claims 4, 9, 16 and 18,

Ohsuki et al illustrates in figure 1 an ultraviolet laser apparatus having a laser (11), which provides a beam having a wavelength of  $1.544\ \mu\text{m}$  [applicant's infrared range] column 10 line 10, illustrates optical fiber amplifiers (18) and (19), and in column 9 lines 40-41 discloses the laser device of figure 1 having nonlinear crystal for wavelength conversion of the amplified light. Column 25 lines 13-25 disclose the wavelength conversion portion used in the laser apparatus of figure 1. Figures 11(a) to 11 (d) illustrates the wavelength conversion portion, which includes a plurality of nonlinear crystals.



Ohsuki et al is silent as to one of the plurality of nonlinear crystal is a GdYCOB nonlinear crystal.

Yoshimura et al discloses in page 193 first column the use of GdYCOB nonlinear crystal for the generation of an ultraviolet laser beam.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the GdYCOB nonlinear crystal of Yoshimura et al with the laser apparatus of Ohsuki et al because it will allow for noncritical phase matching thereby eliminating walk-off between the fundamental and harmonic radiation (see page 193 first column).

Regarding claim 10,

Column 25 lines 44-46 of Ohsuki et al, discloses the laser apparatus of figure 1 along with the wavelength portion of figures 11(a)- 11 (b) as generating an 8<sup>th</sup> harmonic by fourth and second harmonics.

Regarding claim 41,

Column 25 lines 57-62 of Ohsuki et al, discloses using non-critical phase matching (NCPM).

Regarding claims 42, 43,

Column 53 lines 24-30 of Ohsuki et al, discloses a modulator for generating pulses from the laser. Column 53 lines 38-43, discloses an adjustment device for adjusting an emission property of the ultraviolet light.

Regarding claims 44-46,

Column 52 line 63 to column 53 line 2 of Ohsuki et al, discloses illuminating a mask with the ultraviolet laser apparatus and projecting a pattern from the mask onto a substrate.

Claims 5, 7-8, 15, 17, 35-40, 59-64 are rejected under 35 U.S.C. 103(a) as being obvious over Ohtsuki et al (US 6,590,698) in view of Hu et al.

Regarding claims 5, 15, 17,

Ohsuki et al illustrates in figure 1 an ultraviolet laser apparatus having a laser (11), which provides a beam having a wavelength of 1.544  $\mu\text{m}$  [applicant's infrared range] column 10 line 10, illustrates optical fiber amplifiers (18) and (19), and in column 9 lines 40-41 discloses the laser device of figure 1 having nonlinear crystal for wavelength conversion of the amplified light. Column 25 lines 13-25 discloses the wavelength conversion portion used in the laser apparatus of figure 1. Figures 11(a) to 11 (d) illustrates the wavelength conversion portion, which includes a plurality of nonlinear crystals.

Ohsuki et al is silent as to one of the plurality of nonlinear crystal is a KAB.

Hu et al discloses in page 1093 the use of KAB nonlinear crystals for the generation of an ultraviolet laser beam.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to combine the KAB nonlinear crystal of Hu et al with the laser apparatus of Ohsuki et al because the crystal is easy to grow and possesses good chemical stability and mechanical properties (see page 1094 second column).

Regarding claim 7,

Column 25 lines 44-46 of Ohsuki et al discloses the laser apparatus of figure 1 along with the wavelength portion of figures 11(a)- 11 (b) as generating an 8<sup>th</sup> harmonic. Column 52 lines 10-14 discloses the generating a 7-times high harmonic [applicant's seventh order harmonic] by sum frequency.

Regarding claim 8,

Column 25 lines 44-46 of Ohsuki et al, discloses the laser apparatus of figure 1 along with the wavelength portion of figures 11(a)- 11 (b) as generating an 8<sup>th</sup> harmonic by fourth and second harmonics.

Regarding claims 35, 59,

Column 25 lines 57-62 of Ohsuki et al, discloses using non-critical phase matching (NCPM).

Regarding claims 36, 37, 60, 61,

Column 53 lines 24-30 of Ohsuki et al, discloses a modulator for generating pulses from the laser. Column 53 lines 38-43, discloses an adjustment device for adjusting an emission property of the ultraviolet light.

Regarding claims 38-40, 62-64,

Column 52 line 63 to column 53 line 2 of Ohsuki et al, discloses illuminating a mask with the ultraviolet laser apparatus and projecting a pattern from the mask onto a substrate.

Claim 6 is rejected under 35 U.S.C. 103(a) as being obvious over Ohtsuki et al (US 6,590,698) as applied to claim 5 above and further in view of Hu et al and Yoshimura et al.

In column 25 lines 51-60 and column 26 lines 25-40, Ohsuki et al discloses the combination of LBO and BBO nonlinear crystal for the generation of an ultraviolet laser beam.

Ohsuki et al is silent as to the nonlinear crystals being a GdYCOB and KAB nonlinear crystals.

Hu et al discloses in page 1093 the use of KAB nonlinear crystals for the generation of an ultraviolet laser beam.

Yoshimura et al discloses in page 193 first column the use of GdYCOB nonlinear crystal for the generation of an ultraviolet laser beam.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to combine the nonlinear crystals of Hu et al and Yoshimura et al with the lase apparatus of Ohsuki et al because will provide ultraviolet generation with crystals posses good chemical stability and mechanical properties (see page 1094 second column) as disclosed by Hu et al and allowing noncritical phase matching thereby eliminating walk-off between the fundamental and harmonic radiation (see page 193 first column) as disclosed by Yoshimura et al.

***Allowable Subject Matter***

Claims 13, 14, 53-58 are allowed.

None of the searched prior arts alone or in combination discloses the claimed laser device with the recited limitations of independent claim 13, in particular having the anisotropic optical system having magnification different in two directions crossing each other to match individual magnitudes of the luminous fluxes.

Claim 19 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ARMANDO RODRIGUEZ whose telephone number is 571-272-1952. The examiner can normally be reached on 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MINSUN HARVEY can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
ARMANDO RODRIGUEZ  
Examiner  
Art Unit 2828

AR